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John & Kernick
FORM P7

REPUBLIC OF SOUTH AFRICA
PATENTS ACT, 1978

COMPLETE SPECIFICATION

(Section 30(1) - Regulation 28)

| | | | | | |
|---|------------------------------|--------------------------|-------------------|--------------|-----------------|
| 21 | 01 | Official application No. | 22 | Lodging date | J&K Reference |
| 957229 | | | 29th August, 1995 | | AP 31541 ZA/PJW |
| 51 | International classification | | | | |
| | | | | | |
| 71 | Full Name(s) of Applicant(s) | | | | |
| BASF LACKE + FARBEN AKTIENGESELLSCHAFT . A legal body organised and existing under the laws of the Federal Republic of Germany. | | | | | |
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| 54 | Title of Invention | | | | |
| ALUMINUM EFFECT PAINTS AND THEIR USE FOR THE COATING OF PACKAGING | | | | | |
| | | | | | |

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PAT 94 505

07.09.1994

BASF Lacke + Farben Aktiengesellschaft, Münster

Aluminum effect paints and their use for the coating of
5 packaging

The present invention relates to novel aluminum effect
paints, comprising one or more binders and pigments or
pigment mixtures, which essentially comprise

- 10 A) white pearlescent pigment a) and aluminum pigment
c)
B) white pearlescent pigment a), aluminum pigment c)
and white pigment d),
C) bismuth oxychloride pigment b), or
15 D) bismuth oxychloride pigment b) and pearlescent
pigment a), aluminum pigment c) and/or white
pigment d).

Packaging containers such as cans, tubes, canisters or
20 buckets, which are frequently also referred to as
packaging, generally have on their external faces a
coating whose primary function is to protect against
corrosion and to decorate the cans. One of the factors
governing the choice of decorative coating is whether
25 the packaging consists of plate steel or plate
aluminum. This is because a single paint will give a
different visual effect on plate steel than on
aluminum. Therefore, the paints chosen for steel sur-
faces must be different from those chosen for aluminum

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surfaces if it is desired to obtain the same decorative effect.

However, aluminum in packaging, especially in the case
5 of beverage cans, is making rapid progress as a
material because of its advantageous technical and
decorative properties and is in the process of over-
taking steel. Therefore, the customers of the packaging
manufacturers are coming more and more to associate the
10 optical impression of aluminum packaging with ideas of
higher quality and of technical and ecological advance.
Consequently, more and more manufacturers of steel
packaging are attempting to secure their market share
by simulating, on steel, the visual impression of an
15 alumium [sic] surface. The reason for this is that it
is not readily possible for them to change over their
production from steel to aluminum.

Aluminum effect paints have long been known in the
20 automotive sector or in the sector of general indus-
trial coating (Glasurit-Handbuch Lacke und Farben der
BASF Farben und Fasern AG, Curt R. Vincentz Verlag,
Hannover, 1984, pages 468 to 471 and 538 to 541;
EP-A-0 321 470). These known aluminum effect paints are
25 used for the production of coatings which exhibit the
known, brilliant metallic effect with the individual
aluminum flakes being particularly evident. However,
they are unable to create the visual impression of an
aluminum metal surface.

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The object of the present invention is to find a novel aluminum effect paint which no longer has the disadvantages of the aluminum effect paints of the prior art but which, after it has been cured on steel, creates the visual impression of an aluminum metal surface. The novel aluminum effect paint should, moreover, be able to be applied in the manner which is known and conventional for steel packaging, for example by roller coating, so that the existing production lines require no conversion; it should, after it has been cured, display outstanding mechanical and anticorrosion properties, and should be able to be printed using the same decorative finishes used for aluminum surfaces.

15

In accordance with this object, the alluminum [sic] effect paint specified at the outset has been found, which comprises one or more binders and pigments or pigment mixtures which essentially comprise

- 20 A) white pearlescent pigment a) and aluminum pigment c)
- B) white pearlescent pigment a), aluminum pigment c) and white pigment d),
- C) bismuth oxychloride pigment b), or
- 25 D) bismuth oxychloride pigment b) and pearlescent pigment a), aluminum pigment c) and/or white pigment d).

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A novel process has also been found for the production of surfaces which create the visual impression of aluminum metal.

- 5 Furthermore, novel pigment mixtures have been found which bring about a particularly good visual impression.

- 10 An essential constituent of the aluminum effect paint according to the invention is the effect pigment or the effect pigment mixture.

- 15 The first novel pigment mixture to be used in accordance with the invention, (A), essentially comprises at least one white pearlescent pigment [sic] (a) and at least one aluminum pigment (c). In general, one pigment in each case is sufficient to bring about the effect according to the invention. However, the visual impression which is already very good can be optimized still
20 further if two or three white pearlescent pigments (a) are used at the same time. The same applies to the aluminum pigment (c). In special cases, more than four pigments of the same type may be used in each case.

- 25 The weight ratio of white pearlescent pigment (a) to aluminum pigment (c) can be varied within wide limits. It is advantageous in accordance with the invention to use a weight ratio of (a) to (c) of from 15:1 to 1:3,

- 5 -

advantageously from 10:1 to 1:1 and, in particular, from 9:1 to 2:1.

5 Examples of suitable white pearlescent pigments (a) to be used in accordance with the invention are micas coated with titanium dioxide or with titanium dioxide and tin dioxide. Pigments of this art are conventional, known and commercially available under the trade name Iriodin® from Merck, Darmstadt.

10

Examples of suitable aluminum pigments (c) are the commercial aluminum pigments which are marketed in the form of pigment pastes, such as, for example, Sparkle Silver 7005 AR from Silberline, Leven, Scotland.

15

The pigment mixture (A) is present in the aluminum effect paint according to the invention in a proportion, based on the effect paint, of up to 15%, advantageously from 0.3 to 10% and, in particular, from 1 to 20 8%, by weight.

The second pigment mixture to be used in accordance with the invention, (B), essentially comprises the above-described pearlescent pigments (a) and aluminum 25 pigments (c) and also at least one white pigment (d). Examples of suitable white pigments (d) to be used in accordance with the invention are the commercial pigments based on barium sulfate or titanium dioxide, especially rutile.

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In this context, it possible to use two or more white pigments (d) at the same time in order to prepare the novel pigmet [sic] mixture (B). In general, however, the use of one pigment (d) is sufficient.

5

The weight ratio of the pigments (a):(c):(d) can be varied within wide limits. In accordance with the invention it is of advantage to choose the weight ratios such that, based on the pigmet [sic] mixture (B), the percentages by weight are as follows:

10

- a) from 1 to 90% by weight of pearlescent pigment,
- c) from 1 to 80% by weight of aluminum pigment, and
- d) from 1 to 80% by weight of white pigment.

15

In this context, the percentages by weight always add up to 100% by weight. Moreover, it is of advantage in accordance with the invention to use none of the components in a proportion of less than 5% by weight.

20

The pigment mixture (B) is present in the aluminum effect paint according to the invention in a proportion, based on the effect paint, of up to 15%, advantageously from 0.3 to 10% and, in particular, from 1 to 6%, by weight.

25

In accordance with the invention, at least one bismuth oxychloride pigment (b or C) is also used. Pigments (b or C) are commercially available. One example of a

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pigment (b or C) which is of particularly high suitability in accordance with the invention is Mearlite® Perlglanz from H. Costenoble in Eschborn.

5 The bismuth oxychloride pigment (b or C) is present in the aluminum effect paint according to the invention in a proportion, based on the effect paint, of up to 15%, advantageously from 0.3 to 10% and, in particular, from 1 to 8%, by weight.

10

The third novel pigment mixture to be used in accordance with the invention, (D), essentially comprises at least one of the above-described bismuth oxychloride pigments (b) and at least one of the above-described
15 pearlescent pigments (a), at least one of the above-described alumium [sic] pigments [c] and/or at least one of the above-described bismuth pigments (d) [sic].

20 The components (b) and (a), (c) and/or (d) of the pigment mixture (D) according to the invention can be combined with one another in a wide variety of ways and within a wide range of different proportions. The essential requirement of the invention is the [sic] the resulting variants according to the invention, (D1) to
25 (D7):

D1) (b) + (a),

D2) (b) + (c),

D3) (b) + (d),

- 8 -

D4) (b) + (a) + (c),

D5) (b) + (c) + (d),

D6) (b) + (a) + (d) and

D7) (b) + (a) + (c) + (d);

5

give an aluminum effect paint which, after it has been cured on a steel surface, creates the impression of an aluminum metal surface. The person skilled in the art is therefore able to find suitable compositions on the basis of guideline experiment [sic]. In accordance with the invention, advantageous novel pigment mixtures (D) are those which, based on their respective overall quantity, have the following composition:

15 D1) from 10 to 90% by weight of bismuth oxychloride (b) and from 10 to 90% by weight of pearlescent pigment (a)

20 D2) from 20 to 90% by weight of bismuth oxychloride (b) and from 10 to 80% by weight of aluminum pigment (c)

25 D3) from 20 to 90% by weight of bismuth oxychloride and from 10 to 80% by weight of white pigment (d)

D4) from 1 to 90% by weight of bismuth oxychloride (b),

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from 1 to 90% by weight of pearlescent pigment (a)
and

from 1 to 80% by weight of aluminum pigment (c),
with the proviso that the percentages by weight
add up to 100% by weight, it being of advantage in
accordance with the invention to use none of the
components in a proportion of less than 5% by
weight.

10 D5) from 1 to 90% by weight of bismuth oxychloride
(b),

from 1 to 80% by weight of aluminum pigment (c)
and

from 1 to 80% by weight of white pigment (d),
15 with the proviso that the percentages by weight
add up to 100% by weight, it being of advantage in
accordance with the invention to use none of the
components in a proportion of less than 5% by
weight.

20

D6) from 1 to 90% by weight of bismuth oxychloride
(b),

from 1 to 90% by weight of pearlescent pigment (a)
and

25 from 1 to 80% by weight of white pigment (d),
with the proviso that the percentages by weight
add up to 100% by weight, it being of advantage in
accordance with the invention to use none of the

- 10 -

components in a proportion of less than 5% by weight.

- 5 D7) from 1 to 90% by weight of bismuth oxychloride
(b),
from 1 to 90% by weight of pearlescent pigment (a)
and
from 1 to 80% by weight of aluminum pigment (c)
and;
10 from 1 to 80% by weight of white pigment (d),
with the proviso that the percentages by weight
add up to 100% by weight, it being of advantage in
accordance with the invention to use none of the
components in a proportion of less than 5% by
15 weight.

The pigment mixtures (D) according to the invention are
present in the aluminum effect paint according to the
invention in a proportion, based on the effect paint,
20 of up to 15%, advantageously from 0.3 to 10% and, in
particular, from 0.5 to 8%, by weight.

The preparation of the pigment mixtures (A), (B) and
(D) according to the invention has no special features
25 but is carried out with the aid of the mixing
procedures which are customarily employed in the pro-
cessing of pigments and production of paints. However,
it is also possible to add components (a) to (d) of the
pigment mixtures according to the invention

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individually during the production of the aluminum effect paints according to the invention. In this case, components (a) to (d) are generally used in a conventional and known processing form, for example in the form of a made-up paste. The aluminum effect finish according to the invention additionally contains constituents which are conventional and known for a metallic paint.

10 Examples of appropriate constituents are waxes and binders.

Examples of highly appropriate waxes are commercial waxes such as montan waxes, polyethylene waxes, polymer dispersions, natural waxes or ethylene/vinyl acetate copolymers. Examples of particularly highly appropriate waxes are the Cerafac® waxes from BYK Cera, Wesel. The waxes are present in the aluminum effect paint according to the invention in a proportion, based on the effect paint, of from 0.09 to 3%, advantageously from 0.15 to 2% and, in particular, from 0.2 to 1%, by weight.

Examples of highly appropriate binders are the commercial binders, such as modified and nonmodified polyesters, amino resins, especially melamine resins, epoxy resins, polyacrylate resins and phenol-formaldehyde resins, among which the modified

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polyesters, the melamine resins and the epoxy resins are particularly highly appropriate.

One examples [sic] of a modified polyester which is particularly highly appropriate is the commercial product Uralac® CP 1074 SC from DSM Résine France, Bezons, Cedex [sic], France.

Examples of particularly highly appropriate mealmine [sic] resins are the resins marketed under the trade name Maprenal® MF 900, 910, 915, 920 and 927 by Hoechst AG in Frankfurt.

One example of a particularly highly appropriate epoxy resin is Epikote® 1001 from Shell.

It is of advantage in accordance with the invention to use a binder mixture comprising at least one of the above-described modified polyesters, at least one of the above-described melamine resins and at least one of the above-described epoxy resins. In this context, the proportions of the individual binders may be varied within wide limits. It is, however, of advantage, based on the overall quantity of binder, to use

25

- from 50 to 90% by weight of modified polyester,
- from 1 to 20% by weight of melamine resin, and
- from 5 to 30% by weight of epoxy resin,

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since the aluminum effect paints according to the invention which result thereby are particularly advantageous.

5 In the aluminum effect paints according to the invention, the binders are present in quantities which are entirely conventional for metallic paints. However, they are advantageously used in a proportion, based on the effect paint, of from 20 to 60% by weight, in particular from 25 to 50% by weight.

In addition, the aluminum effect paint according to the invention also contains conventional and known solvents. The choice of these depends primarily on the solubility properties of the particular binders used, so that the person skilled in the art can propose the solvents suitable in each case on the basis of his or her expert knowledge. Examples of particularly advantageous solvents are butylglycol and butyldiglycol acetate.

In the aluminum effect paints according to the invention, the solvents are present in a proportion, based on the effect paint, of from 20 to 80%, advantageously from 30 to 70% and, in particular, from 40 to 65%, by weight.

Furthermore, the aluminum effect paint according to the invention may also contain further conventional and

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known additives, such as wetting agents or leveling agents or agents for controlling the rheology, in conventional and known proportions.

5 The production of the aluminum effect paint according to the invention has no special features but is carried out by the mixing procedures which are conventional and known in the field of paint preparation. For instance, the above-described constituents of the aluminum effect
10 paint according to the invention are weighed in the particular quantities desired into a suitable container and are then homogenized. In this context, it proves advantageous to use high-speed stirrers. The pigments (a) to (d) or the pigment mixtures (A), (B) and (D)
15 according to the invention can in fact be supplied to the container together with the binders and with the remaining constituents of the aluminum effect paint according to the invention. However, it is advantageous to include a portion of the binders and of the remain-
20 ing paint constituents in the initial charge, and only then to add the pigments (a) to (d) or the pigment mixtures (A), (B) or (D) in the form of a paste made up with solvent. Thereafter, the rest of the binders and the rest of the remaining constituents are added, in a
25 procedure referred to in expert circles as make-up.

The aluminum effect paint according to the invention is distinguished by its good stability on storage and by its good processability, which is of great advantage in

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terms of its industrial use. For instance, relatively large quantities can be prepared for processing without settling or separation of the paint constituents being a risk in the case of prolonged idle times.

5

The aluminum effect paint according to the invention is outstandingly suited to the coating of substrates of every kind, especially packaging and, in this utility, above all for the exterior coating of cans or the like.

10 However, it can also be used for interior coating. This packaging may comprise a very wide range of materials and may have a very wide variety of geometries. Particularly suitable materials are black plate, tin plate and various iron alloys, which are provided if
15 desired with a passivation layer based on compounds of nickel, of chromium and of zinc. The packaging may be in finished form or in the form of can halves such as bodies and lids, as three-part or as two-part drawn and wall-ironed cans or cans deep-drawn in another way,
20 such as beverage or preserve cans.

In terms of the methods used, the application of the aluminum effect paint according to the invention shows no peculiarities but is carried out with the aid of the
25 application methods as conventional and known in the paints sector, such as rolling, knife-coating, brushing, roller coating, spraying, flow-coating or dipping. It is of advantage according to the invention to apply the aluminum effect paint to the packaging in

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a layer thickness of from 1 to 40, advantageously from 2 to 35 and, in particular, from 3 to 30, micrometers and to cure the finish at a temperature (of the packaging) of from 150 to 400°C, in particular from 180 to 250°C, for from 10 s to 10 min, advantageously from 30 s to 5 min and, in particular, from 50 s to 1 min 30 s.

After it has been cured, the aluminum effect finish according to the invention gives the coated surfaces, especially the packaging surfaces, the appearance of an aluminum metal surface. Moreover, it offers outstanding protection against corrosion and can be recoated with printing inks with [sic] without problems. In respect of hardness, elasticity, adhesion, freedom from pores and resistance to pasteurization and to solvent, it proves to be equivalent, if not superior, to the conventional, known packaging coatings.

20 Examples

Examples 1 to 6

The preparation and use of aluminum effect paints according to the invention

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General preparation procedure:

A portion of the binder, of the wax and of the solvents
5 were weighed into a stirrer container and homogenized
using a high-speed stirrer. Afterwards, the pigment
mixture according to the invention or the bismuth
oxychloride pigment was made into a paste with
butyldiglycol acetate and, after stirring for 20
10 minutes, mixed with a portion of the binders, of the
wax and of the solvents. The resulting mixture was
homogenized with a high-speed stirrer and added to the
stirrer container. After homogenization for 10 minutes,
the remaining amounts of binder, wax and solvent were
15 added, in a "make-up" procedure.

The resulting aluminum effect paint according to the
invention was applied by roller coating to the bodies
of two-part tin plate cans in a layer thickness of from
20 7 to 12 micrometers and baked for 60 s at a can
temperature of 200°C. The resulting surface was
visually assessed by comparing its visual impression
with the body of an uncoated aluminum can. All aluminum
effect paints according to the invention gave the
25 desired optical impression of an aluminum surface.

The table gives an overview of the material composition
of the aluminum effect paints according to the
invention of Examples 1 to 6.

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Table: Composition of the aluminum effect paints according to the invention of Examples

1 to 6

Composition in % by weight

(solids composition in % by weight)

Example

| | 1 | 2 | 3 | 4 | 5 | 6 |
|------------------------------|---------------|------------------|-----------------|------------------|------------------|------------------|
| Constituents | | | | | | |
| Polyester ¹⁾ | 27 (66.6) | 27.33 (58.82) | 27.3 (58.82) | 27.34 (55.82) | 28.21 (60.88) | 26.78 (59.44) |
| Melamine resin ²⁾ | 3.5 (8.63) | 3.12 (6.72) | 3.12 (6.72) | 3.12 (6.37) | 3.22 (6.95) | 3.06 (6.12) |
| Epoxy resin ³⁾ | 7.5 (18.5) | 11.91 (25.63) | 11.9 (25.64) | 11.92 (24.34) | 12.3 (26.54) | 11.68 (23.31) |

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1 2 3 4 5 6

Constituents

Pigments:

(a) 4)

1.5 3 2.8 - - -
(3.7) (6.46) (6.03)

(b) 5)

- - - - - 5
(9.98)

(c) 6)

0.248 0.5 0.7 1 1.5 -
(0.61) (1.08) (1.51) (2.04) (3.24)

(d) 7)

0.25 - - 5 0.5 -
(0.62) (10.21) (1.08)

Solvent 8)

59.462 53.54 53.59 51.02 53.66 49.9

Wax 9)

0.54 0.6 0.59 0.6 0.61 0.58
(1.33) (1.29) (1.27) (1.22) (1.32) (1.16)

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- s = see above
- 1) = Uralac® CP 1074 SC from DSM Résines France
- 2) = Maprenal® 910 from Hoechst
- 3) = Epikote 1001 from Shell
- 5 4) = 4794 Iriodin® 9111 Rutil Feinsatin WR from
Merck
- 5) = Mearlite® Perlglanz EP 91143 from Costenoble
- 6) = Sparkle Silver 7005 AR from Silberline
- 7) = Example 4: barium sulfate pigment
- 10 7) = Example 5: titanium dioxide pigment
- 8) = Mixture of butylglycol and butyldiglycol
acetate
- 9) = Cerafac® from BYK Cera

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Patent claims

1. Aluminum effect paints comprising one or more
5 binders and pigments or pigment mixtures, which
essentially comprise
 - A) white pearlescent pigment (a) and aluminum
pigment (c)
 - 10 B) white pearlescent pigment (a), aluminum pigment
(c) and white pigment (d),
 - C) bismuth oxychloride pigment (b), or
 - D) bismuth oxychloride pigment (b) and pearlescent
pigment (a), aluminum pigment (c) and/or white
pigment (d).
- 15 2. Aluminum effect paint according to claim 1, which
additionally contains waxes.
3. Alumium [sic] effect paint according to claim 1 or
20 2, with modified polyesters as binder. .
4. Alumium [sic] effect paint according to one of
claims 1 to 3, with melamine resins as binder.
- 25 5. Alumium [sic] effect paint according to one of
claims 1 to 4, with epoxy resins as binder.
6. Use of aluminum effect paints according to one of
claim [sic] 1 to 5 for the coating of packaging.

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7. Packaging with a coating, especially exterior coating, prepared from the aluminum effect paint according to one of claims 1 to 5.
- 5 8. Use of pigments or of pigment mixtures which essentially comprise
- A) white pearlescent pigment (a) and aluminum pigment (c)
- B) white pearlescent pigment (a), aluminum pigment (c) and white pigment (d),
- 10 C) bismuth oxychloride pigment (b),
- D) bismuth oxychloride pigment (b) and pearlescent pigment (a), aluminum pigment (c) and/or white pigment (d),
- 15 for the production of surfaces which create the visual impression of aluminum metal.
9. Process for the production of surfaces which create the visual impression of aluminum metal, by
- 20 applying an aluminum effect paint to a substrate and curing the resulting coat of paint, characterized in that in this process an aluminum effect paint according to one of claims 1 to 5 is used.
- 25 10. Process according to claim 9, characterized in that the substrate comprises packaging.
11. Pigment mixture which essentially comprises
- a) white pearlescent pigment and/or

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- b) bismuth oxychloride pigment and
- c) aluminum pigment.

12. Pigment mixture which essentially comprises
- 5 a) white pearlescent pigment and
 - b) bismuth oxychloride pigment.

13. Pigment mixture according to claim 11 or 12, which additionally contains
- 10 d) white pigment.

14. Pigment mixture according to one of claims 11 to 13, comprising, based on the pigment mixture,
- 15 a) from 0 to 90% by weight of pearlescent pigment,
 - b) from 0 to 90% by weight of bismuth oxychloride pigment,
 - c) from 0 to 80% by weight of aluminum pigment, and
 - d) from 0 to 80% by weight of white pigment,

20

with the proviso that

- (i) the percentages by weight always add up to 100% by weight,
- 25 (ii) component a) must be present in the pigment mixture if component b) is not present therein, and vice versa, and


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(iii) component c) must be present in the pigment mixture if component b) is not present therein.

15. Aluminium effect paints substantially as herein described with reference to any one of the examples of the invention.

DATED THIS 28TH DAY OF AUGUST 1995


JOHN & KERNICK
FOR THE APPLICANT